# Feedback from participants of the Genetic Engineering Workshop

After the workshop, a short questionnaire was administered to garner feedback on our teaching methods and areas for improvement. A brief summary of data from 15 out of 19 workshop participants is represented here.
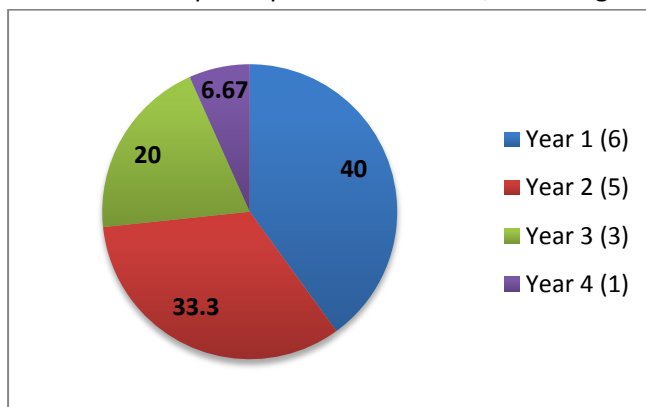
Profile of workshop participants

1. **Major**

   73.3% of workshop participants were life science students, with nearly a quarter of participants hailing from non-biological sciences.
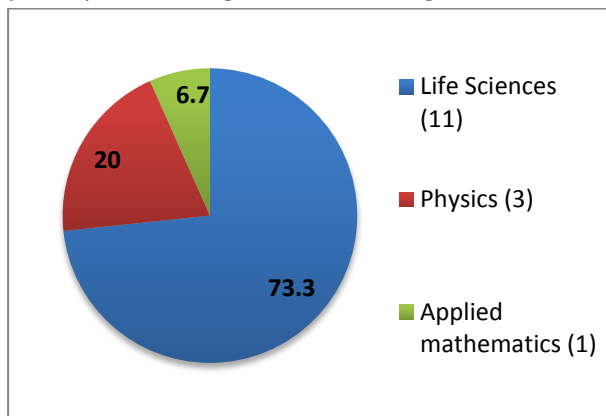
2. **Year of Study**
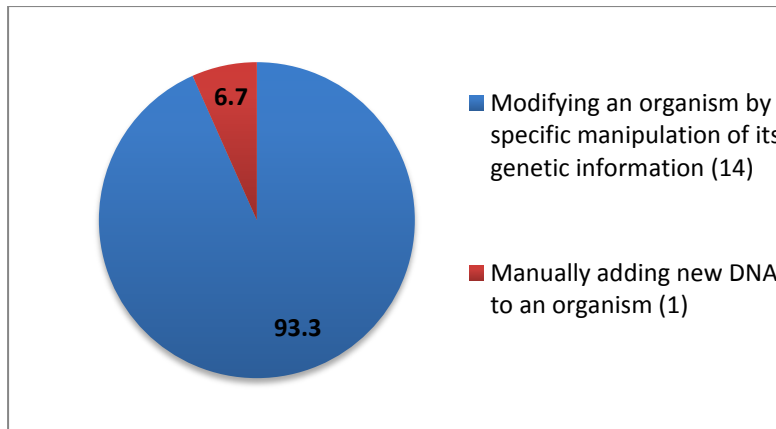
   The bulk of the participants were Year 1/ 2 undergraduates.

**Evaluating conceptual understanding of workshop participants**

3. What is genetic engineering?

14/15 participants were able to correctly define genetic engineering.

4. What is a plasmid?

Both definitions given are correct; we emphasised the utility of plasmids to carry genes. However it is also important to note that plasmids are circular. Most of the participants managed to grasp that the plasmid is a vector DNA.
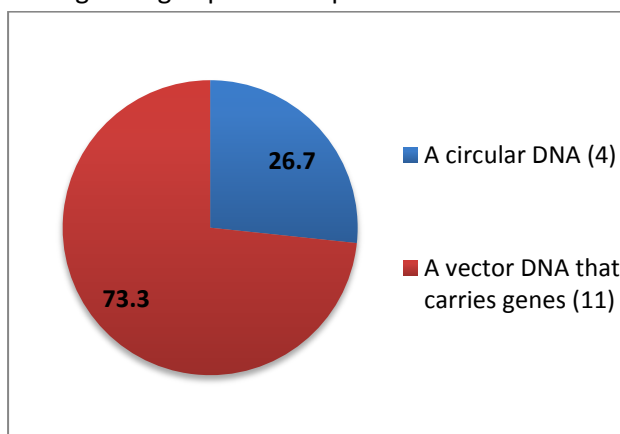
5. What does a Promoter do?

A majority of participants (14/15) correctly understood that a promoter enables the expression of genes. The option 'Encode Modifiers' is incorrect as promoters in themselves do not code for any products.
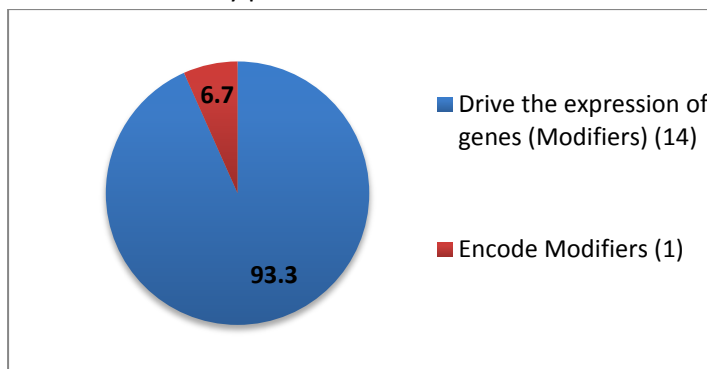
6. **Why are control mechanisms important in genetic engineering?**

This question was presented with options attached to checkboxes to tick off

6/15 participants recognised that genetic modifications could result in unregulated mechanisms.

3/15 participants recognised that some genes could pose risks during real world applications in genetic engineering.

Almost all participants (14/15) could grasp that implementing control mechanisms allowed for expression of the correct gene products at appropriate times.

Why are control mechanisms important in genetic engineering?

- ☐ Unregulated mechanisms could go wrong
- ☐ Some genes pose risk in real world applications
- ☐ Having control mechanisms allow for expression of correct genes when appropriate

7. **What is Polymerase Chain Reaction (PCR)?**

All participants understood the concept of PCR as a tool to amplify specific sequences of DNA. This was reinforced with the wet lab immersion after the brief introduction at the start of the workshop.
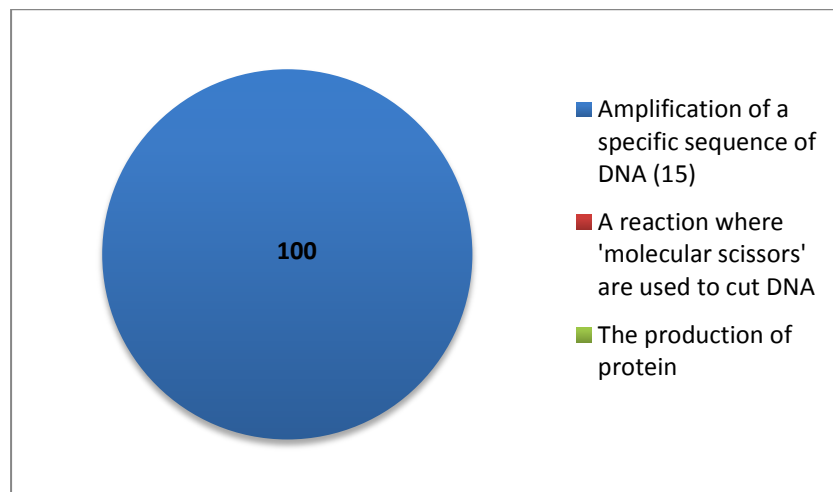
8. **What is bacterial transformation?**

All participants understood the concept bacterial transformation, and could distinguish between merely transferring DNA into the bacterium and inducing expression of specific gene products.

The transfer of exogenous DNA into a bacterium (15) — 100

- The transfer of exogenous DNA into a bacterium (15)
- Making bacteria glow with a fluorescent protein
- The expression of proteins in a bacterium, such as insulin
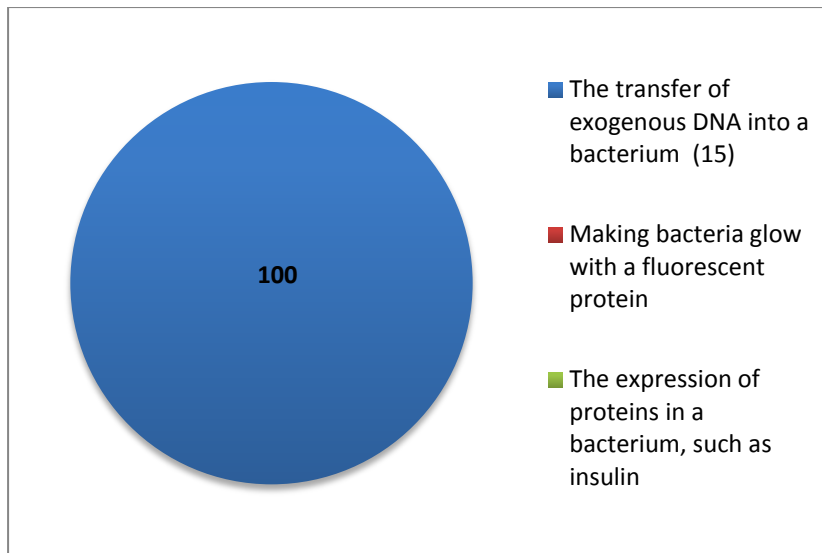
9. Which segment did you enjoy most in this workshop?

More students enjoyed the genetic engineering puzzles as compared to the wet lab components, indicating that the activity was successful in engaging students.

PCR (3) — 20
Bacterial Transformation/ Microscopy (3) — 20
Genetic engineering puzzles (9) — 60
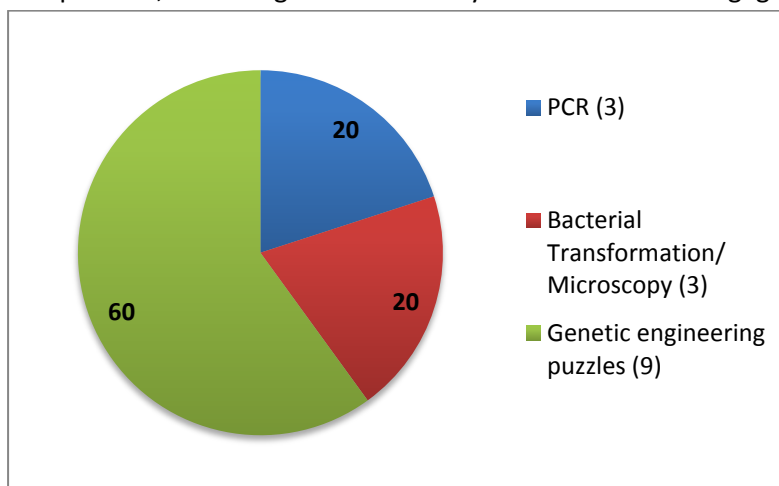
10. Feedback

The workshop was generally well-received by the participants.

We have taken feedback from workshop participants on board to modify the format of the genetic engineering puzzles for future teaching applications, and to run the workshop in a more engaging manner, in addition to consulting educators in the field.

'The nomenclature for the genetic puzzles are slightly confusing.'

'Speakers were good.'

'Workshop would well suit a undergraduate audience. However, for lower levels, the workshop could more too advanced. Also the principles behind each step of genetic engineering would be better explained. Also, for a young audience, the workshop could be more communicative than instructive.'

Appendix: Feedback Form Given to Participants

Feedback for the SPS iGEM Genetic engineering workshop

Thank you for joining us for this genetic engineering workshop! Before you go, please help us improve by filling this in. =)

We hope you enjoyed your time with us and be sure to let us know if you have any suggestions or other questions by mailing us at yihan.tan12@sps.nus.edu.sg

Major*_

Year of Study*_
- ○ Year 1
- ○ Year 2
- ○ Year 3
- ○ Year 4
- ○ Other

What is genetic engineering?*_
- ○ Modifying an organism by specific manipulation of its genetic information
- ○ Directed evolution of an organism
- ○ Changing the characteristics of an organism
- ○ Other:

What is a plasmid?*_
- ○ A vector DNA that carries genes
- ○ A protein
- ○ A circular DNA
- ○ Other:

What does a Promoter do?*_
- ○ Drive the expression of genes (Modifiers)
- ○ Encode Modifiers
- ○ Other:

Why are control mechanisms important in genetic engineering?
- ☐ Unregulated mechanisms could go wrong
- ☐ Some genes pose risk in real world applications
- ☐ Having control mechanisms allow for expression of correct genes when appropriate

What is Polymerase Chain Reaction (PCR)? *

- ○ A reaction where 'molecular scissors' are used to cut DNA
- ○ Amplification of a specific sequence of DNA
- ○ The production of protein
- ○ Other: [   ]

What is bacterial transformation? *

- ○ The expression of proteins in a bacterium, such as insulin
- ○ Making bacteria glow with a fluorescent protein
- ○ The transfer of exogenous DNA into a bacterium
- ○ Other: [   ]

_===Which segment did you enjoy most in this workshop? *

- ○ Introduction to genetic engineering
- ○ Genetic engineering puzzles
- ○ PCR
- ○ Bacterial Transformation/Microscopy

Which segment did you find most challenging in this workshop? *

- ○ Introduction to genetic engineering
- ○ Genetic engineering puzzles
- ○ PCR
- ○ Bacterial Transformation/Microscopy

Any other feedback? We would like to improve the workshop, and all feedback is welcome!